LIGHTING SCIENCE GROUP CORPORATION

Optimized Digital Lighting™

LED's as an Emerging Source for General Illumination

OPPORTUNITIES

1. LONG LIFE

- 50 times longer than incandescent
- 4-5 times longer than fluorescents

2. LOW POWER CONSUMPTION

- Uses 6-7% of the energy used by incandescent
- Uses 25-30% of the energy used by fluorescents

3. DURABLE

- Withstand shocks, vibrations and frequent switching unlike fragile incandescent bulbs

4. ENVIRONMENTAL IMPACT

- LED's contain no mercury or toxic gases so disposal is easy.

5. LOWEST TOTAL COST OF OWNERSHIP

- **Bulb Cost + Electricity**
- **Savings on Labor, Air Conditioning and Insurance**

CHALLENGES

1. POWER SUPPLY

- LED's use DC current vs. AC current used by existing Illumination systems.
- Life of Supply in contrast to LED life performance
- Efficiency

2. THERMAL MANAGEMENT

- **Junction Temperature of devices**

  Increase in Junction temperatures result in decrease of light output

- **LED thermal Conductivity**

  Package & interface material create bottle neck in system design

3. LED PACKAGE

- **Chemical Compatibility**

  High Output Levels in Small Form factors can degrade the package causing shifts in color temperature & light output

4. LENSES

RESEARCH

1. Thermal Management
2. Optical Management
3. Packaging Efficiency
4. Die Management
5. Hybrids